

NASA's Functional Task Test: Informing the Design of an Integrated Countermeasure System

J.J. Bloomberg¹, C.D. Batson², R.E. Buxton³, A.H. Feiveson¹, I.S. Kofman⁴, S. Laurie⁴, S.M.C. Lee⁴, C.A. Miller⁴, A.P. Mulavara⁵, B.T. Peters⁴, T. Phillips⁴, S.H. Platts¹, L.L. Ploutz-Snyder⁵, M.F. Reschke¹, J.W. Ryder⁵, M.B. Stenger⁴, L.C. Taylor⁴, and S.J. Wood⁶

¹NASA-Johnson Space Center, Houston, TX, ²MEI Technology, Houston, TX, ³University of Houston, Houston, TX, ⁴Wyle Science, Technology, & Engineering Group, Houston, TX, ⁵Universities Space Research Association, Houston, TX, ⁶Azusa Pacific University, Azusa, CA

Contact: Jacob Bloomberg (jacob.j.bloomberg@nasa.gov)

INTRODUCTION: The goals of the Functional Task Test (FTT) study were to determine the effects of spaceflight on functional tests that are representative of critical exploration mission tasks and to identify the key physiological factors that contribute to decrements in performance.

METHODS: The FTT was comprised of seven functional tests and a corresponding set of interdisciplinary physiological measures targeting the sensorimotor, cardiovascular and muscular adaptations associated with exposure to spaceflight. Shuttle and ISS crewmembers as well as subjects who experienced 70 days of 6° head-down bed rest were tested pre and post spaceflight and bed rest. The bed rest analog allowed us to isolate the impact of body unloading on performance without other spaceflight environmental factors then to compare those results with data obtained from spaceflight.

RESULTS: For Shuttle, and ISS subjects, functional tasks requiring a greater demand for dynamic control of postural equilibrium showed the greatest decrement in performance. These changes in functional performance were paralleled by similar decrements in sensorimotor tests designed to specifically assess postural equilibrium control. Bed rest subjects experienced deficits similar to spaceflight subjects in both functional tests with balance challenges and in sensorimotor tests designed to evaluate postural stability.

CONCLUSIONS: Taken together, the spaceflight and bed rest data indicate that body support unloading experienced during spaceflight plays a central role in postflight alterations of functional task performance and balance control. These data point to the importance of supplementing inflight exercise countermeasures with balance and sensorimotor adaptability training performed with imposed body loading.

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